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THE PLACE OF RESEARCH IN RANGE MANAGEMENT

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U.S. FOREST SERVICE PHOTOS

There can be no progress without research. No industry can continue to meet the present day competition unless it is continually developing new products or new and better methods of production. This fact is well illustrated in the field of plastics—a recent product developed by research. The importance of this research is emphasized by the financial budget of such industries as Dow Chemical, DuPont, and others. It is of no less importance in the field of range management.

Helpful information can be obtained in several ways. Sometimes new methods and procedures are discovered by observation through trial and error. But this procedure is costly and indefinite. Controlled field studies and laboratory investigation are essential in research. In range management research, as conducted by the Forest Service, emphasis is placed on controlled field studies supported with detailed studies of individual plant responses to certain stimuli.

Range Research Problems

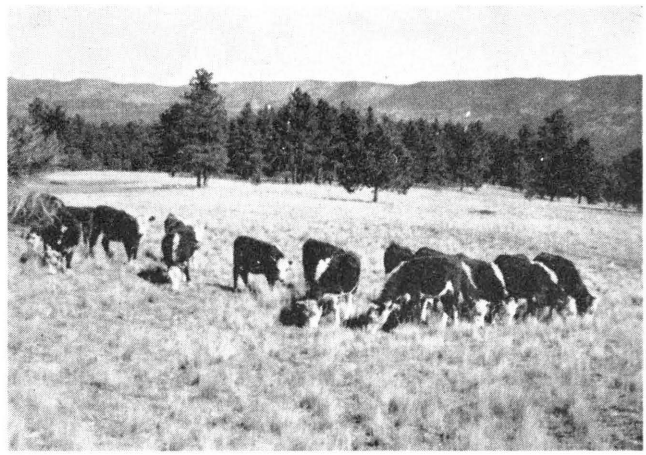
The type of range management research being conducted at the Manitou Experimental Forest, in central Colorado, can be used to illustrate the work of the Forest Service in this field. The Manitou Experimental Forest is located in the ponderosa pine zone at an elevation of 7,600 feet. This area is typical of the foothills and low mountains of the Colorado Rockies.

Three major problems are being studied. They are: (1) Management of native bunchgrass ranges; (2) management of wornout and abandoned farmlands that have been reseeded to grass; and (3) the relation of water runoff and soil erosion to different conditions resulting from different types of range management.

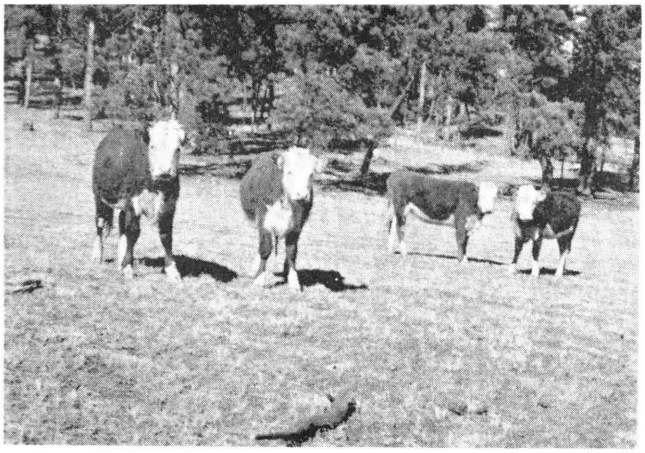
One of the most important basic factors of range management is proper utilization of the range forage. If grazing use is too heavy, the health and vigor of the plants will be destroyed and production of forage and grazing capacity will decrease. If use is too light, maximum efficiency will not be obtained from a livestock operation. In order to determine proper use of pine-bunchgrass forage, six 300-acre experimental ranges have been grazed at three intensities of use since 1941. This study has shown that proper utilization of this native bunchgrass range is 35 to 40 percent of the total annual yield of grass and sedge herbage.

Etudies of cattle on these ranges have shown that moderate grazing (Fig. 1) will produce 40 to 50 pounds more grain per animal during a 5-month season than will heavy grazing. (Fig. 2). Most of the gain, made by young animals, regardless of stocking rate, occurs during June, July, and August. During September and October little or no gain is obtained. For market cattle the forage consumed during this period contributes very little to the value of the animal and could best be utilized by the breeding herd or replacement heifers. Thus, earlier sales of market animals are indicated.

Moderate grazing use has maintained a healthy vigorous stand of native bunchgrasses, but heavy grazing has severely weakened the good forage species and inferior plants are increasing in abund-



Moderate grazing—more forage, better livestock.



Overgrazing—forage depleted, poor livestock.

ance. During 1953 the production of grass and sedge herbage on open grassland parks in moderately grazed ranges amounted to 807 pounds per acre. Similar areas in heavily grazed ranges produced 540 pounds of herbage per acre. Of this amount 347 pounds were produced by blue grama—(*Bouteloua gracilis*)—an inferior and less palatable grass than the native bunchgrasses. In contrast, blue grama produced only 140 pounds per acre on moderately stocked pastures.

Watershed Control

Moderate grazing also maintains a satisfactory watershed condition. Studies of surface runoff and erosion on permanent pine-bunchgrass plots have demonstrated that although moderate grazing does allow more surface runoff to occur, the healthy plant cover prevents accelerated erosion. On the other hand, heavy grazing permits both excessive runoff and erosion to occur. Studies of the infiltration capacities of soils using temporary plots in the grazing intensity ranges have substantiated these results.

Economically moderate grazing is far superior to heavy grazing. Estimated net income from pastures moderately stocked may be from 50 to 100 percent more than income from heavily stocked pastures. Three factors are primarily responsible: (1) Greater gains per animal and equal or greater gains per acre; (2) less interest on the investment in livestock grazed; and (3) higher market values for animals sold in the fall. This last factor may be the most important of all. Appraised valuations for cattle from moderately stocked ranges at the Manitou Experimental Forest are $1.50 to $2.00 more per hundredweight than for similar animals grazed on the heavily stocked ranges.

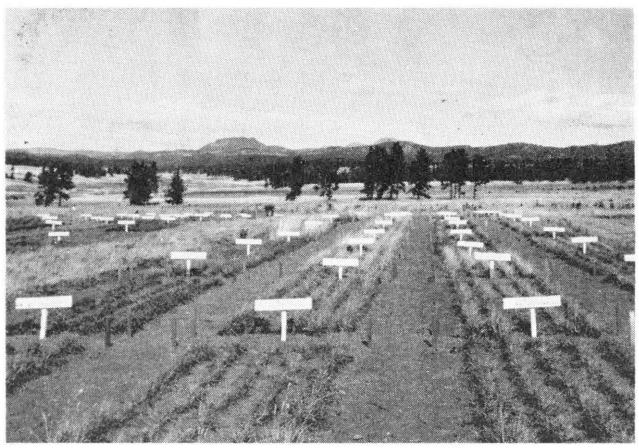
The results of this research on native bunchgrass ranges are far reaching. They point the way to more successful management of livestock operations. They furnish both the private and public land managers with guidelines to follow in maintaining productive ranges. Properly applied, they will enable the mountain rangelands to compete more successfully with the inherently more productive lowland areas.

Unfortunately there are many thousands of acres of mountain rangelands that through overgrazing, or farming, or both, no longer produce good stands of native bunchgrass. On these areas improvement through livestock management alone may be a long process. Recent research in range reseeding has pointed the way to improve these lands rapidly and economically. In many cases production due to reseeding is often higher than could be expected from the original good native bunchgrasses.

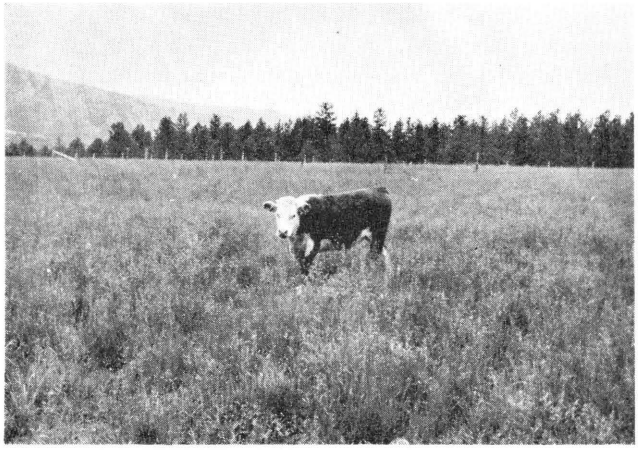
The Manitou Experimental Forest may again be used as an example of research in this field. Three main steps in this program are: (1) What to seed? (2) how to seed? and (3) how to manage the stands after they are established?

Reseeding Experiments

In order to find out what to seed in the Front Range area of Colorado, all available promising plants were first seeded in small row plots. (Fig. 3). This was a screening process to eliminate those plants that were not adopted to local soil and climatic conditions. Species that were rated good or excellent in these tests were then tried under field conditions at different elevations, with varying climatic and site conditions. These trials furnished the basic information on species adaptability. Approximately 180 different range plant species have been tried in the row-plot tests with about one-half being rated as good or excellent for planting in the foothills and low mountains of the Front Range. Only 35 of these have been tried in extensive field-plot plantings. Of these, drought, winter cold, and inability to resist invasion by other plants has reduced the number of recommended species to six. These are crested, intermediate, and beardless wheat-grasses, (*Agropyron cristatum, A. intermedium and A. inerme*) smooth brome, (*Bromus inermis*), big bluegrass, (*Poa ampla*), and Russian wildrye. (*Elymus junceus*). These grasses can fill a wide variety of needs in the grazing requirements of livestock.



Test plots of forage plants.



Reseeded ranges may be highly productive.

Even the best of these grasses will not produce good stands unless proper methods of planting are used. Studies have shown that the best stands of grass are produced on areas that have been plowed to remove existing plant competition, packed to provide a firm seedbed, and planted with a drill to get proper and uniform depth of seed coverage. Whenever it is necessary for any reason to shortcut this procedure, poorer stands inevitably result.

Range seeding does cost money. In most cases it means an investment of from $5.00 to $10.00 an acre. In order to protect this investment it is necessary to graze properly and manage efficiently. Perhaps less information is available in this than in any other phase of reseeding. At the Manitou Experimental Forest reseeded pastures of crested wheat-grass, smooth brome, a mixture of these two grasses, intermediate wheatgrass, and Russian wildrye are being studied to determine what constitutes proper utilization of these grasses. Under the soil and climatic conditions of the Experimental Forest it has been found that for smooth brome and intermediate wheatgrass at least 4 inches of ungrazed stubble must be left at the end of the grazing season if the plants are to remain healthy and vigorous. On the other hand, crested wheatgrass has been grazed to a 2-inch stubble height for six consecutive summer seasons without apparent injury.

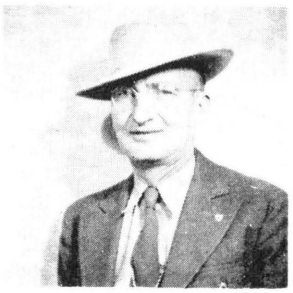
Effects of Reseeding

The productivity of reseeded ranges cannot be denied. (fig. 4) Herbage yields will range from 1,000 pounds per acre to as much as 3,000 pounds or more depending upon the kind of grass used. Good stands of native bunchgrasses under the same condition will produce 600 to 800 pounds per acre. Beef production or total pounds of gain per acre is also high. At the Manitou Experimental Forest total gain from summer grazing has ranged from 50 to over 100 pounds per acre. This is considerably higher than the 12 to 15 pounds obtained from good condition native bunchgrass ranges. Furthermore, the productivity of these reseeded ranges has been obtained on wornout, abandoned farmland that produced less than 50 pounds of palatable forage per acre before seeding.

Reseeding, however, is not a cure-all for problems of range management. In fact it presents new and even more difficult problems of management not encountered on native ranges. For instance, yields of crested wheatgrass may vary from 2,900 pounds per acre one year to 600 pounds per acre in another year. This wide variation is due to fluctuations in rainfall and is more pronounced on reseeded ranges than on native ranges. This problem can best be solved by maintaining a flexible livestock unit, such as a cow-calf-yearling type of operation.

The Future

There are many other problems of management of both reseeded ranges and native ranges that are in need of research to find the most efficient methods of management. For example, one field of intermediate wheatgrass in private ownership is grazed extremely heavy during the spring – cattle are then removed and growth recovers sufficiently to cut for hay in September. This treatment would seem to be more severe than grazing to a 2-inch stubble height for the summer period but it has not damaged the stand of grass nearly as much. This emphasized the importance of season of use in the management of reseeded grasses. This and other problems are recognizd by research groups and should be studied as funds and manpower become available.



ABOUT THE AUTHOR . . .

W. M. Johnson is employed by the Rocky Mountain Forest and Range Experiment Station as a range conservationist, and is assigned to the Manitou Experimental Forest. He graduated from Utah State Agricultural College is 1933 with a B.S. degree in range management. He obtained his advanced work in plant physiology and soils from the University of Minnesota in 1937. His first active assignment to research was with the Forest Service at the United States Sheep Experiment Station at Dubois, Idaho. Later he was assigned to the Davis County watershed project in northern Utah. In 1936 he was transferred to his present assignment in Colorado. He is the author of numerous publications dealing with range management and watershed problems in both the ponderosa pine and shortgrass types of vegetation.